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1. A device for detecting volatile chemical reagents in a gaseous sample, comprising:

a fluorescent material comprising at least one polymer-surfactant complex

comprising:

a fluorescent, ionic conjugated polymer; and

an oppositely charged surfactant;

a contact region where a gaseous sample may associate with the polymer-surfactant complex;

a light source that emits light to excite the polymer-surfactant complex and cause it to fluoresce; and

a detector that detects the fluorescent emissions intensity from the polymer-surfactant complex.

2. The device of claim 1, wherein the polymer-surfactant complex is in a polar solution.

3. The device of claim 2, wherein the polymer-surfactant complex in solution is in a container with at least a portion of the container being formed of a gas-permeable membrane, and wherein the contact region comprises the gas-permeable membrane.

4. The device of claim 1, wherein the ratio of surfactant molecules per monomer repeat unit of polymer ranges from about 1:1 to about 1:10.

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5. The device of claim 1, wherein the ratio of surfactant molecules per monomer repeat unit of polymer is about 1:3.

6. The device of claim 1, wherein the detector comprises a detection device and an output device.

7. The device of claim 6, wherein the output device displays the fluorescent emissions intensity.

8. The device of claim 6, wherein the output device transmits the fluorescent emissions intensity to a remote location.

9. The device of claim 6, wherein the output device records the fluorescent emissions intensity for later analysis.

10. The device of claim 6, further comprising:  
at least one support structure;  
an inlet; and  
an outlet.

11. The device of claim 10, wherein the support structure encloses the detection device, light source, contact region, and the fluorescent material; and wherein the inlet and outlet allow the gaseous sample pass by the contact region and associate with the polymer-surfactant complex.

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12. A device for reusably detecting volatile chemical reagents in a gaseous sample, comprising:

a fluorescent material comprising at least one polymer-surfactant complex comprising:

a fluorescent, ionic conjugated polymer; and

an oppositely charged surfactant;

a contact region where the gaseous sample may associate with the polymer-surfactant complex;

a light source that emits light to excite the polymer-surfactant complex and cause it to fluoresce;

a detector that detects the fluorescent emissions from the polymer-surfactant complex; and

a vacuum device configured to evacuate the gaseous sample from the region of the polymer-surfactant complex after the complex has been exposed to the gaseous sample.

13. The device of claim 12, wherein the polymer-surfactant complex is disposed as a thin film.

14. The device of claim 13, wherein the polymer-surfactant film is a bilayer in which a film of the fluorescent, ionic conjugated polymer is covered by an outer layer of the oppositely charged surfactant.

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15. The device of claim 13, wherein the polymer-surfactant film is a solid precipitate that is formed by complexing the fluorescent, ionic conjugated polymer with a sufficient quantity of the oppositely charged surfactant.

16. The device of claim 15, wherein the polymer-surfactant film is prepared by spin coating the solid precipitate from a solvent.

17. The device of claim 15, wherein the polymer-surfactant film is cast from the solid precipitate.

18. The device of claim 15, wherein the solid precipitate is formed by complexing the polymer and surfactant in a ratio of surfactant molecules per monomer repeat unit of polymer of about 1:1.

19. The device of claim 12, wherein the detector comprises a detection device and an output device.

20. The device of claim 19, wherein the output device displays fluorescent emissions intensity received by the detection device from the polymer-surfactant complex.

21. The device of claim 19, wherein the output device records fluorescent emissions intensity received by the detection device from the polymer-surfactant complex.

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22. The device of claim 19, wherein the output device transmits fluorescent emissions intensity received by the detection device from the polymer-surfactant complex to a remote location.

23. The device of claim 13, wherein the fluorescent material comprises an  
5 array of polymer-surfactant complex films.

24. The device of claim 23, wherein each polymer-surfactant complex film comprises a different polymer-surfactant complex, and wherein the array of polymer-surfactant complex films and the detector are configured such that the detector can detect the presence and concentration of various volatile chemical reagents.

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